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SILICOSIS AS AFFECTING MINING WORKMEN AND OPERATIONS

BY

D. HARRINGTON

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SILICOSIS AS AFFECTING MINING WORKMEN AND OPERATIONS[1]

By D. Harrington[2]

The occurrence of dusts in underground workings creates many difficult and, in some instances, contradictory and conflicting problems for workers, operators, and all others interested in health and safety in mining and tunneling. Moreover, there are many misconceptions both as to the actual effect of most dusts which may be encountered in underground work and as to remedial or alleviating measures. Although the harmfulness of mine dusts to health of miners has been mentioned by many writers in ancient times, much of our really authentic knowledge of the effect of underground dusts upon health or safety in both coal and metal mines has been gained during the past 30 or 35 years. There has been, however, a considerable amount of generalizing from some local condition or occurrence or theory rather than arriving at conclusions after extended studies and observations made not only in mines and tunnels but also in town, camps, and plants, and comprising data on as many different mining and tunneling localities, conditions, etc., as could be secured with reasonable expenditure of time or money. This paper gives some observations based on the writer's 30 odd years of experience in and around both coal and metal mines, including approximately 20 years' close study of dust disease with detailed surveys and reports on dust occurrence and effects in considerably more than 100 mines in probably 20 States of the Union. The observations are those of an engineer and in many respects conflict with the "going" ideas of doctors, pathologists, and others who have written on dust disease.

Where the word dust is used in this paper in connection with respiratory disease, it refers to solid particles which float or can float in the air breathed by workers. Although these particles are usually dry, they may be wet; in general, their dimensions are so small as to be invisible to the naked eye. Dusts in coal mines which may be involved in the initiation or extension of explosions, are generally thought to be those which are smaller than 20-mesh in size but chiefly finer than 100-mesh; coal-mine dusts which are harmful to health of workers have essentially the same general physical characteristics as other dusts, but usually consist of smaller particles.

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From the writer's personal investigations and observations, as well as from fairly close study and contacts of various kinds with the investigations and observations of others, there appears to be warrant for the conclusion that any dust, or combination of dusts - whether in a coal mine, a metal mine, or a tunnel - which is insoluble or difficultly soluble in the fluids and tissues of the respiratory organs is likely to be harmful ultimately to the health of underground workers if it is present in the air in minute form and is breathed in large quantity over large portions of the working shift for any considerable number of months consecutively per year. However, some soluble dusts which occur in underground workings are also decidedly harmful. It appears that the quantity of dust likely to be found in the air of underground workings, together with its insolubility, governs its hygienic harmfulness much more than its specific physical or chemical qualities. This does not mean that air containing a large quantity of finely divided flint dust or similar hard, sharp, insoluble siliceous or other material is not likely to be more harmful than air containing a similar quantity of probably less inherently harmful dust, such as very fine limestone, coal, or shale. Breathing comparatively small amounts of finely divided free silica or similar hard, sharp, insoluble, supposedly more dangerous type of dust, is, however, likely to be much less harmful to health than breathing large amounts of less inherently harmful dust, such as that from coal, shale, hematite ore, limestone, or combinations of these. Moreover, the dust of free silica (probably the most harmful dust in air of underground workings) apparently does not always take a form equally harmful to all who breathe it.

Physical examinations of underground workers show that men who work in very dusty places in coal mines have definite respiratory disease, whether the dust consists of coal only or a mixture of coal with rock or shale or clay. Men have worked in coal mines and have then gone to work in dusty metal mines or tunnels and have become affected by miners' consumption, or have worked in metal mines or tunnels and later have been seriously afflicted with respiratory disease after having worked in dusty places in coal mines. While dusts that are insoluble or difficultly soluble in the fluids and tissues of the respiratory organs are chiefly responsible for respiratory disease in miners, there are certain soluble dusts of lead, arsenic, and rocks or ores which are definitely poisonous or which result in material harm to the health of workers. Many, probably most, present-day authorities on dust disease think that silica dust is harmful chiefly because, in the very finely divided form in which it enters the lungs, it goes into solution and causes attendant chemical reactions impairing or destroying the lung tissues.

The main sources of air dustiness in metal mines or tunnels are, in the order of their importance: Dry drilling of holes for blasting - the dry drilling of holes pointed upward, especially those from about 60° to vertical, is in general the worst producer of harmful dust in the air breathed by underground workers; blasting of dry rock or ore - which produces dangerous gases and throws immense quantities of finely divided dust into the air; shoveling, or mucking, of very fine, dry material at the working face, which is usually poorly ventilated; loading cars from chutes; dumping loaded cars into chutes;

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and timbering. Dry crushing and other occupations in metal mines and in metal-mine mills also produce dangerously dusty conditions.

That the quantity of dust breathed is the important point in the harmfulness of dust is a certainty, yet to state what is that dangerous quantity or what is a safe limit is difficult - in fact, it is impossible - with our present facilities and knowledge. In South Africa an arbitrary limit of 5 mg, or 300,000,000 particles per cubic meter (or 300 particles per cubic centimeter) of air, was set. Recent reports, however, give the average air dustiness of South African mine working places as about 1 mg per cubic meter and less than 200,000,000 particles per cubic meter of air. There is probably not one dry mine or tunnel in the United States where the average air dustiness of working places is as low as 5 mg per cubic meter of air (the South African standard) or 10 mg per cubic meter of air (the standard set by Higgins and Lanza in their study of miners' consumption in the Joplin, Mo., district in 1915). A recent State regulation in the United States restricts the number of dust particles to a maximum of 15,000,000 per cubic foot of air or about 530,000,000 per cubic meter (somewhat more than 75 percent more than allowed in South Africa). In general, the average air dustiness of working places in our dry metal mines where dry drilling is done is above 20 mg per cubic meter of air. In many it is above 50. Dry drilling of upper holes in some cases throws into the air breathed by the driller as high as 7,000 mg of highly siliceous dust per cubic meter of air, or 1,400 times the maximum allowed in South Africa. As an average, dry drilling of the upper holes (those above 60°) in dry friable material, such as some kinds of granite or quartz, produces about 150 to 200 mg per cubic meter of air. With holes under 60°, dry drilling produces about 50 mg, while wet drilling makes about 5 to 20 mg of air-borne dust per cubic meter of air. The cuttings from dry drills in metal mines sometimes contain nearly 50 percent of dust that will pass through a 200-mesh screen, and a large percentage of this will probably pass through a screen of several hundred mesh.

While any dust present in large quantities and in finely divided form in the air breathed by underground workers undoubtedly is likely, in time, to be decidedly harmful to health, some dusts are more harmful than others, some individuals and some nationalities are more susceptible to harm than others, and some occupations or occupational conditions accentuate the harmfulness of the dust present. Other factors may contribute, such as high temperature or high humidity, or air unduly depleted of oxygen or high in such gases as carbon monoxide, carbon dioxide, etc., which may add to the dust harmfulness by depressing the worker's vitality or unduly accelerating his rate of breathing. Or again, the atmospheric conditions as to temperature, humidity, and freedom from gases may be ideal for performance of maximum quantity of work, but if the worker has an incentive through contract or piecework prices to work at maximum capacity, he may incur maximum harmfulness from the breathing of dust if it is present in the more or less still air in finely divided form and in large quantities. On the other hand, there may be good ventilation, with resultant currents of pure, cool, moving air, to alleviate the harmfulness of dust occurrence; or water may be used freely and efficiently with like good effect.

Insoluble or difficultly soluble dust in the underground air generally manifests its harmfulness to the health of miners as some form of lung disease. These various forms are given such names as miners' consumption, silicosis, anthracosis, miners' asthma, phthisis, and possibly pneumonia. In addition, dusts undoubtedly are largely responsible for much bronchitis, and some soluble dusts are poisonous. Dust disease, however, should be given the more inclusive and much more nearly accurate name "pneumoconiosis" or the simpler one "dust disease".

It is the general belief that the dusts most harmful to the lungs range in size from 0.25 micron, possibly as small as 0.1 micron, up to 10 microns (a micron being one one-thousandth of a millimeter or approximately one twenty-five thousandth of an inch). It is the writer's belief (though this is not in accordance with the general, almost universal, opinion of dust-health experts, especially the pathologists) that the harm is due chiefly to the filling or partial filling of lung cells, tissues, etc., with dust, thus preventing these tissues from performing their normal functions; and that there is additional harm from the continual irritation caused by these foreign materials and by the efforts made to dislodge them. Possibly, too - and this is the theory of most present-day dust-disease experts as to the harmfulness to the lungs in connection with the breathing of dusts - harm may be done by the chemical or other action which takes place when large numbers and amounts of the very fine dusts are dissolved in the lungs. That many of these small dust particles are dissolved is inferred from the fact that it has been proved that very small particles of flint and chert - free silica material soluble only with difficulty when the particles are of visible size - are definitely soluble in distilled water.

Dust particles which result in asbestosis and possibly in bronchitis and kindred diseases are probably larger in size - up to 50 or even 100 microns; these larger particles seem not to get into the lungs or at least not to remain there; but they cause considerable irritation in the respiratory passages, and also clog protective devices and prevent them from intercepting the finer dusts from going into the lungs. While the dust of free silica, such as quartz, flint, chert, etc., is probably the most harmful of the dusts ordinarily found in underground workings, physical examinations of underground employees who have worked in the dusty air containing coal and shale as well as in the dust from ores of hematite (iron oxide), calcite (limestone), and other essentially nonsiliceous material, show definite amounts of lung involvement, as indicated by X-ray photographs as well as by the usual physical or physiologic symptoms, but especially by shortness of breath.

Local conditions intensify the harmfulness of dust in the air. When men work on a contract basis they exert a maximum physical effort, hence breathe fast and deeply, and thereby draw maximum quantities of dust into the respiratory organs. Similarly, where the dusty air is high in carbon dioxide or low in oxygen respiration is accelerated, and the lungs take in a maximum amount of dust. When dusty air is stagnant with high temperature and humidity (for example above 80°F. and 90 percent relative humidity) the vitality of the body is depressed, respiration is accelerated, and the dust condition apparently gets its maximum opportunity to harm the worker. Very fine dust (from 10 microns down), when once suspended in air by any mining operation, remains in suspension for long periods (generally several hours - even with material of fairly high specific gravity) and the worker breathes this dust-laden air practically throughout the shift, if the air is stagnant; hence it is important to have currents of fresh air continually sweeping through and past all working faces and places. Good ventilation (next to the efficient use of water) is probably the best preventive of dust disease in mines, but the fresh, pure air must be circulated where the men work.

Some individuals seem to be immune to dust disease; old-time underground workers (with underground experience of 30 or more years in dry, dusty mines) have told the writer about numerous friends and coworkers who succumbed to dust disease, yet they themselves appeared to be healthy. On the other hand, there are records of men who were in their graves from dust disease within a year of the date of first underground work; and serious dust involvement due to 2 or 3 years' underground work is not at all uncommon. Racially the Finns, the Irish, and the Negroes seem most susceptible to health harm from dust. Environment and living conditions unquestionably have a vital effect on occurrence of dust disease, and underground workers whose homes are hovels, whose eating and sleeping habits and accomodations are abnormal or subnormal, who are addicted to drink, who are afflicted with one or more of the various so-called social diseases, are very likely to be susceptible to dust disease and ultimately to succumb to it.

While there is absolutely no doubt that dust diseases are directly responsible for the death of several hundred underground workers annually in the United States and indirectly responsible for the death or disability of several thousand others, unfortunately exact figures are not available, partly because many doctors apparently do not know how to diagnose the disease but chiefly because in the regions most afflicted a concerted effort usually has been made toward minimizing publicity about the dangerous conditions. In fact, "pussyfooting" about dust disease not only in mining but in industry generally is now and has for many years been largely the rule, and this more than any other influence has caused the present-day "racket" in connection with dust disease.

Instead of recognizing the menace due to the diseases of various kinds associated with the breathing of dust and instead of taking advantage of the methods available for combating or preventing them - or at least making a study of the situation with a view to alleviating the harmful conditions and their terrible results - there appears to have been a concerted effort to hide the facts in most instances and to take as few measures as possible toward elimination of the diseases and of the conditions causing them. Miners, especially metal miners, whose health is most directly affected usually refuse to allow themselves to be examined physically previous to or during employment. They frequently oppose the use of wet drills - which probably more than anything else will remedy the dangerous dust condition - and in many instances they destroy or try to make ineffective the water attachments to drills. When water is provided to wet down the dust it is generally not used, except when the mine boss forces the worker to it. And

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metal-mine workers only too frequently destroy or partly destroy ventilation equipment installed for their safety, comfort, and health. Mine operators or officials sometimes deny the existence of miners' consumption or other dust disease among employees even when they know or suspect its existence, yet frequently some of the mine bosses themselves are afflicted by such disease. Suggestions as to remedial methods or equipment - such as sprinkling or the use of water in drilling or on muck piles, or the use of fresh-air currents to remove dust - are held to be impracticable or are considered the dream of the theorist, even though these methods or devices are in thoroughly successful use inother mines or in other localities. While sometimes the objection to change is due to disinclination or inability to withstand the probable financial outlay, frequently the main obstacle is the fact that mine officials are of the reactionary type; the old-timer with years of experience and more or less limited education usually hates to do anything that he has not been accustomed to doing. He repels the idea that dust in his particular mine is or can be harmful and very often denies the possibility of having enough dust present to be harmful.

In the South African mines on the Rand more miners are employed than in all of the metal mines of the United States, and the problem of dust disease is not "side-stepped" as it is and has been in the United States. About 30 or 35 years ago a very complete health study was made, revealing the extreme seriousness of dust disease among the workers and resulting in the adoption of drastic laws and regulations, which apparently are rigidly enforced and which are said to have resulted in a marked decrease in the incidence of the disease and in the death rate from it. Mines with 1,000 or more men underground must have men especially detailed on dust and ventilation work, whereas only a few of the metal mines or tunnel operations in the United States even consider dust or ventilation. South African mines must have running water in not less than a 1-inch pipe within 50 feet of the working place, and with a minimum pressure of 30 pounds a square inch; extremely few of our metal mines, on the other hand, have water available near faces. South African mines must have water blasts and sprays at or near all working faces; few, if any, of our metal mines have them. All drilling in South Africa must be done with drills in which water flows through the drill into the hole and prevents formation of dust; many of our miners and mine officials insist that "it can't be done," especially in the drilling of upper holes. In South Africa all blasting must be done after the men are out of the mine, the region where blasting is done must be thoroughly wet down before and after blasting, and men may not enter until 30 minutes have elapsed after blasting; in the United States, generally blasting may be done at any time, no provision is made to wet places at any time before or after blasting, and men return to blasted places essentially when they see fit to do so. South African mine traveling-ways and ore or rock piles must be sprinkled sufficiently to prevent the presence of dust in the air; very few metal mines or tunneling operations in the United States do anything toward sprinkling, and most of the operators say it is unnecessary and impracticable. In South Africa old mine workings must be closed, air currents must be split, air dustiness and chemical composition must be determined periodically by sampling and analysis, shift bosses must make

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daily records of the use of water against dust, and many other preventive regulations practically unknown in the United States are in effect and said to be strictly enforced. Carbon dioxide must not exceed 0.2 percent in working places, whereas in the United States many of our workers in underground places breathe air with a high proportion (2 percent or upward) of carbon dioxide. Carbon monoxide must be less than 0.01 percent; but some of our mines have 0.01 to 0.05 percent of carbon monoxide at working places during all or a large part of the working shift.

In South Africa over 80 percent of the workers are native Kaffirs, and the white men present, acting chiefly as overseers, rarely do the hard, dangerous work at the face; in the underground workings of metal mines in the United States, on the other hand, practically all work is done by white men where natural conditions frequently are even more unfavorable than are those of South Africa. We have very few and very incomplete regulations, and most of these are ignored.

The outstanding remedy for the bad situation with respect to dust disease is education - education of underground workers in the necessity for taking such precautions as are available; of employers in the importance of recognizing the seriousness of the situation, providing devices and methods to reduce or prevent the incidence of the disease, and, if necessary, forcing their adoption on the workers; of doctors in the need for correctly diagnosing disease, giving publicity to its prevalence, seriousness, and remedies if available, etc., and issuing death certificates religiously assigning dust disease as the cause where such is the case; and of merchants, newspapers, and other influences in the community in the rightness of trying to prevent the disease rather than hiding its existence.

As specific remedial measures for metal mines and tunnels, the following are suggested: Mechanical ventilation, with a definite person or persons in charge, should be adopted to force moving currents of fresh gas- and dust-free air to every place where men work - to remove or at least dilute dust, heat, and gases in the air breathed by workers. The use of water should be enforced in all drilling, in sprinkling ore and rock piles, and in wetting timbers, manways, haulageways, and every place where dust may be found. Some dust experts are now discussing the abolition of the use of water in connection with prevention of mine-air dustiness, but the writer believes that next to providing ventilation to remove or dilute dust in air, the careful, systematic use of water offers the best present-known method of combatting the health hazard from breathing dust. Where possible, all the blasting should be done after a shift; where this cannot be done there should be enforcement of strict regulations as to the wetting of the region of blasting both before and after the shots are fired, as to the removal of all explosive fumes by adequate air currents, and as to the prevention of entrance into a blasted place until all dust, fumes, etc., have been removed. Metal mines in Canada which have been doing much work in connection with air-dust abatement have found that blasting is by far the worst mining practice in filling the mine air with the fine dust likely to do the most harm to persons engaged in underground work. There should by all means be strict physical examinations of underground workers before employment and at periods of not more than 6 months during employment, with prompt removal of the worker from dangerously dusty work should unfavorable physical symptoms be found.

The dust-health problem in mining is likely to be very much in evidence in the future, and our mining men will find it to their advantage to look into this subject and to take quick, drastic action or the so-called "racket" on dust disease will have such serious consequences as to put many mining companies out of business. There is no question that far too much stress has been laid on silica dust and silicosis, whereas emphasis should be placed on the very definite dangers to workers in breathing a large quantity of any kind of finely divided dust which accumulates or is likely to accumulate day by day in the worker's system. The resultant respiratory disease should be termed "pneumoconiosis" or simply "dust disease" rather than "silicosis" or "anthracosis", etc., since it is highly probable that no person has ever been incapacitated or has ever died from breathing any single dust but rather from a combination of dusts, accompanied by other contributory influences or conditions.

While it appears that all dust and combinations of dusts which are breathed into the respiratory passages in large quantities and over considerable periods of time are likely to be harmful to health, unquestionably some dusts are relatively more harmful than others. Some dusts affect the lungs, some the bronchial apparatus, some the eyes, some the septum of the nose, some the stomach, and some the skin. Some individuals have considerable resistance to the harmful effect of breathing dust, others are readily susceptible; some nationalities are likely to succumb quickly to dust disease, and others are much better able to resist its inroads on health. Having breathed one kind of dust does not aid any human being to resist any other kind. Tuberculosis may accompany the other ills due to breathing of silica dust, but tuberculosis does not always accompany or result from breathing of silica or any other dust; tuberculosis may occur in connection with the breathing of coal dust or other dusts, though it is not so likely to be found in connection with coal dust as with some other types.

Silica in a chunk of rock, whether as free silica (SiO_2) or as a silicate, is practically insoluble in water but in the form of very finely divided particles which float in air it is readily soluble even in distilled water. No human being knows what percentage of silica in a dust is likely to cause silicosis, whether 1 percent, 25 percent, 50 percent, or more, and silicosis (so-called) is alleged to have been caused by breathing dust with as little as 3 percent silica. No person knows what quantity of dust in air (silica or other dust) is likely to be dangerous, though numerous arbitrary standards of air dustiness have been given to the public, these standards ranging from as low as 250,000 particles per cubic foot of air to 15,000,000 particles. With the present numerous, one might almost say innumerable, uncertainties as to what causes dust disease, as to what dusts or combinations of dusts are harmful, and as to many other important phases of the subject, it seems anything but good policy - at least at present - to write into laws rigid requirements as to maximum allowable dust counts or weights. Certainly any such requirements should be labeled "tentative" if made at all.

Present methods of determining air dustiness, whether by weight or by count of particles, are anything but accurate or dependable, and it is now fairly well established that with present dust sampling and analytical methods results are likely to vary several hundred percent in accordance with the personal equations of the individuals who do the work. While the X-ray is unquestionably useful in determining whether respiratory passages have suffered dust harm, it is improbable that any person can determine from the X-ray alone whether the person X-rayed has silicosis, anthracosis, or any other specific type of dust disease - generally no two X-ray experts will check each other as often as 5 cases out of 10 in making interpretations.

Practically every human being breathes silica dust, because 50 percent or more of the earth's crust is siliceous - and probably 15 percent or more is free silica - and all of us breathe dust from fields, roads, etc. Hence it is, or should be, perfectly apparent that it is quantity of dust breathed, and this includes free silica as well as other dusts, that determines air-dust harmfulness. Dusty air with high temperatures (that is, over 80°F.) and high humidity is more likely to be harmful because of dust than similar air with less trying temperatures. Dust-laden air contaminated with gases, such as carbon dioxide (over one half of 1 percent) or carbon monoxide (over one hundredth of 1 percent) is more likely to cause ill health than would air with the same amount of dust but without such high content of extraneous gases.

Dust disease may incapacitate its victim, or may even kill him, in less than a year from the time he first works in the dusty place, but in general it takes a much longer period. It is said that a person may work in a dusty atmosphere for several years without apparent ill health yet succumb to dust disease several years after leaving the dusty work. Generally, when a worker has become afflicted with dust disease, it has been (at least up to the present) impossible to cure him so as to completely remove the ill effects. This is aptly expressed by a doctor in The American Stone Trade, August 1933, as follows: "No treatment for the cure of silicosis is known. We can't make stiff tissue soft again. Prevention is the only recourse." It is said that sickness causes at least eight times as much loss of time by workers as do industrial accidents, and one of the most prolific causes of sickness of industrial workers is the breathing of dust. Dust disease unquestionably is the scourge of the industrial worker of today, and this is especially the case with the metal miner.

The mining industry should recognize that any and all dusts breathed in large quantities for long periods are likely to be dangerous to the persons who breathe them; then available measures should be taken to prevent air dustiness, the most essential being:

1. Use water in drilling, in sprinkling surfaces, and in connection with all dust-making processes.

2. Use the best possible ventilation to dilute or sweep away any fine dust which may get into the air where people work.

3. Do no blasting during the working shift and see that the air of working places is cleared of dust after blasting and before men return to work.

4. Install the best available equipment to prevent dust formation and avoid as far as possible the use of dust-producing practices, processes, or devices.

5. Have every person in the organization undergo a real physical examination before entering upon duty and at stated intervals (not less than annually), possibly with removal from dusty air as soon as symptoms develop in the respiratory tract; however, it should be mentioned that some well-informed persons do not believe that persons in the incipient stages of dust disease should be barred from doing further work in mines.

6. All those really interested in the preservation of the health of workers should familiarize themselves with available data as to dust dangers; a limited bibliography on this subject has been issued recently by the United States Bureau of Mines in Information Circulars 6835, 6840, 6848, and 6857.

7. While there is now an enormous amount of litigation as to dust disease, chiefly as to the misnomer "silicosis", and while a vast amount of material has been written and published on the subject, definite, dependable, accurate knowledge about dust disease (its causation, prevention, or remedies, medical or legal) is woefully lacking, and there is probably no more fruitful field for concerted, unbiased, disinterested investigation than that in connection with the health harmfulness from dust.

8. In the absence of more definite knowledge about practically all phases of dust disease, common sense would appear to dictate that mining people should by all means place themselves on the safe side by trying to prevent dust formation and to eliminate it so far as possible, if it must be made. In fact, the following admonition taken from the Journal of the American Medical Association, issue of September 9, 1933, may well be heeded:

> "There are admittedly many difficulties in the accurate diagnosis of the varied forms of pneumoconiosis. * * * * In more than one industry today the most important slogan in the 'new deal', from the standpoint of welfare defined in terms of human health and comfort, would be Stop the Dust."

9. Legal phases of the health harm from breathing dust are as complicated and as lacking in definiteness as are most of the other phases of the subject and they are made almost hopeless when court trials are under way by the lack of really dependable knowledge in the medical fraternity as to the disease.

Wisconsin has had wide experience on occupational diseases and an article entitled, "Dust, Fumes, Vapors, and Gases" in Industrial Medicine, November 1932, gives much interesting information and in connection with court cases on silicosis (so-called) is the following: "There were no two physicians who could, or would, agree on a diagnosis of any individual case" and adding that in general these doctors "could not be classed as giving other than such as conformed to their honest opinion and belief."

A lawyer writing on "Silicosis - In Certain of Its Legal Aspects" in the October, 1932, number of Industrial Medicine, among many interesting comments, says:

> "Throughout this article 'silicosis' alone has been mentioned. Silicosis is supposed to be a disease of the lungs resulting from silica dust, and the use of the term would indicate that the only dust that is of concern to industry is silica dust. This, however, is erroneous.
>
> "Because sickness from dust exposure is commonly referred to as silicosis, there are many industries having a dust hazard that are not cognizant of the fact and remain in ignorance of it until they are greeted with a summons. Subsequent investigation and a conference with counsel bring home the fact that there is some merit to the suit, and that there is also an industry hazard that is going to prove expensive. The check-up will also often reveal, where there is insurance, that because this hazard was not known to exist there is no coverage for it, and that the problem is thus one which the company's lawyers will have to cope with and which the company will have to pay for.
>
> "Concluding, the writer wishes to emphasize the two propositions: First, that it is extremely important that silicosis and kindred sicknesses be taken out of the common law and made a part of the workmen's compensation acts of various States; and second, that later legislation should be well-considered and should have the benefit of thorough study and research by capable and skilled medical men as well as the attention of lawyers fully cognizant of the needs and with original ideas as to the proper remedy."

Other lawyers are opposed to the inclusion of dust disease in the compensation laws, indicating that the lawyers as well as the doctors, pathologists, and others supposed to have a knowledge of dust disease are in anything but accord as to facts, procedure, or policies.

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CONCLUSION

"STOP THE DUST" should be not only the slogan but also one of the major health and safety efforts of mining employers and employees, including those engaged in working in all kinds of dry mines. Ventilation is one of the most effective alleviating agencies and the use of water is a close second. Certain types of up-to-date equipment serve as very important adjuncts in the reduction of dustiness of air breathed by workers, but devices or equipment which are effective for one industry may be dangerously inefficient in others; some types of respirators may be used to advantage under what might be termed desperate conditions, but they are by no means "cure-alls" for the avoidance of disease from dust.

Dry drilling, with simultaneous utilization of certain dust-removal systems, seems applicable to at least some surface operations but has not yet been proved successful in many (if any) mines, and it should be remembered that it is impracticable to use dry drilling in some types of rock. If water is not used in drilling many underground faces will be very dry, and the dust from blasting, shoveling, loading, timbering, and other work will be kept floating in the air in maximum quantities unless ventilation is more than ordinarily efficient. Unquestionably, however, the most essential feature in the avoidance of law suits, sickness, disease, and death due to the inhalation of dust in industry is the recognition that all types of finely divided dust which float in large quantities in the air breathed by workers are almost certain to be harmful. This means that essentially all mines which are not wet are likely to have many places with dangerously dusty air and that the dust-making processes should be reduced to a minimum. If production of dust cannot be prevented, the dust should be kept out of the air as much as possible by the use of water or some other suitable method; when the dust cannot be kept out of the air, the air should be removed at once from working places - or at least diluted by adequate, controlled ventilation.

At present the mining industry (as well as numerous other industries) is confronted with what is termed a "racket" in law-suits and other demands in connection with health harm (real or alleged) due to dust-in-air. There is good reason to believe that the admittedly bad plight of industry (including mining) in connection with dust disease is due to the fact that, up to and including the present time, engineering and operating officials have ignored or dodged the issue and left the matter in the hands of the medical, pathological, and legal professions. As a result, scores of millions of dollars in law suits over dust disease are now pending against industry (including mining) and very frequently industry has essentially no defense when the "show down" comes.

Health problems in the mining industry should be handled essentially as have safety problems. The doctor and at times the pathologist, possibly the texicologist, are needed in connection with accidents to determine the extent to which the victim has been injured and to try to save his life and limbs after an accident has occurred - or to restore him to health. But in the prevention of accidents (or of injuries due to accidents) the doctor is and probably always will be of relatively minor aid and the problem is one which must be handled chiefly by the engineer or the supervisory officials. Under this set-up, decided progress has been made in the prevention of accidents during the past 10 to 20 years and more especially in the past 5 years; on the other hand, with occupational-disease matters, including dust disease, left almost wholly in the hands of the medical and legal "fraternities" so little progress has been made in getting adequate, definite knowledge of dust disease, its cause, remedy, or method of prevention, that industry (including mining) is now confronted with a decidedly serious problem.

It has been known for much more than 20 years that dust disease has been more or less prevalent in our mines and factories yet so little has been actually done towards its eradication that the present "racket" is causing what is almost a panicky feeling in the minds of our mining and industrial executives. Volumes of abstruse medical literature have been published on the subject of dust disease but these have done little or no good towards clearing up the vast amount of uncertainty in the medical ranks as to the disease, its diagnosis, remedies, or almost any other strictly medical phase of the subject. Certainly the mining man, whether worker or operator, has been given essentially nothing as to the protection of the worker, or the type of dust or dusts or combinations of them, or the amount or size of dust which is likely to be harmful, or the composition of the so-called harmful dust as distinct from the so-called negative or inhibitive dust, or almost a score of other phases of the problem which most certainly should be known before trying to promulgate rigid standards whether in the form of law or otherwise. In other words, while the engineers and mine and industrial operating officials have either ignored or dodged the issue - and of course have done but little in the mine or plant to prevent health trouble - the medical people, pathologists, and others (very few of whom ever saw the inside of a mine) have given practically no definite data as to causation of the disease or of its treatment; and right now the medical, pathological, and other experts on dust disease are almost as far apart as the poles as to fundamental facts and factors in connection with the disease. As far as preventing the disease is concerned, relatively few of the most prominent dust experts ever saw the inside of a mine, hence any so-called advice they may give as to dust-disease preventive measures for mining should be (and usually is) essentially worthless.

On the legal side of the matter, there is almost as much confusion, chaos, and uncertainty as on the medical side and each State has its own procedure (or rather lack of it). As to what can be done in connection with lawsuits or prospective lawsuits whether from the side of the plaintiff or the defendant, much depends on local laws, local industrial conditions, or even the personality of local judicial authorities. It is the exception rather than the rule when real justice is done in decisions on dust disease, because of the almost innumerable uncertainties - medical, legal, and otherwise - about the disease. To protect both the worker from possible dust disease and the employer from future lawsuits or heavy compensation charges from this disease, it seems advisable that all of the precautions now thought applicable be taken; at least, this gives maximum available protection to both worker and employer. The employer should remember that for generations it has been axiomatic under the law that it is the duty of the employer to provide a reasonably safe place in which his employees can work (and it now seems that "safe" includes the idea of health also); in general, the employer is also required by law to supply relatively safe equipment and appliances. The obligations of the employee are not so definitely known but, in general, if the employee refuses to utilize the precautionary measures or equipment furnished him, the probability of securing damages in court in case of accident or ill health is much diminished, and also if the employee supinely accepts working conditions which are so palpably unsafe or unhealthful as to be evident to any reasonable person, this may bar him from being successful in court procedure. Certainly, violation of State law is likely to cause the violator to lose his probable rights when in court. However, the legal side of the question is too abstruse and too confused for the layman, especially an engineer, to try to understand or expound.

This matter of preventing ill health in mining and in industry is just as definitely an engineering-operating problem as accident prevention. When a mine accident occurs, all of us are much interested in knowing the extent of the injury (information which the doctor alone usually can give), but we are even more concerned as to the conditions in the mine which brought about the accident and as to what can be done to prevent a similar (possibly worse) accident to someone else. Here the doctor is of essentially no aid, and the engineer and the operating man have gone a long way towards learning and applying the solution. As a result, our accident rate in mining (coal as well as metal) has been falling year by year - somewhat slowly but nevertheless effectively. Essentially a similar situation exists as to health in industry and especially as to dust disease in mining. The more definitely the matter is kept in the hands of the engineers and operating officials, taking counsel of course, with medical, pathological, legal, and other experts who are working on the problem, the sooner will mining and other industries be able to correct - or at least materially improve - the present almost intolerable situation confronting them in occupational diseases and especially in dust disease.

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